

**ABSTRACT**

Inorganic-organic hybrid mixture sol-gel encapsulated lipid vesicles which are composed of silyl lipids or a mixture of silyl lipids and phospholipids are provided. The present invention also provides encapsulated Langmuir Blodgett (LB) membranes and biological macromolecules. The sol-gel encapsulated lipid vesicles, LB membranes and proteins possess a higher stability than conventional vesicles. Inorganic-organic hybrid mixture sol-gels are provided as novel sol-gel materials possessing desirable mechanical and physicochemical properties. Also provided are methods of preparing encapsulated lipid vesicles, LB membranes and proteins. Methods of performing renal dialysis using compositions of the invention are also provided.